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ABSTRACT

The interactions of 10-month-old infants and their mothers were observed using mathematical models of interaction which state that the child's behavior depends on recent characteristics of mother's behavior, and that the mother's behavior depends on recent characteristics of the child's. Therefore, changes in the intensity of the behavior of one cause changes in the intensity of behavior of the other. There were no differences between boys and girls in the extent to which they were influenced by their mothers, nor were there any differences between mothers of girls and mothers of boys in the extent to which they were influenced by their infants. In general, infants were significantly more often in control of the interactions. Boys were found to be significantly more insistent than girls. Boys who were insistent at 10 months had close physical relationships with their mothers at 22 months. Girls who were insistent had distant physical relationships with their mothers one year later. (EN)

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Mother-Infant Interaction: A New Approach

by

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When a mother and her child interact with one another, each exerts influence on the behavior of the other. Our understanding of the nature of that mutual influence depends largely upon the ways in which we, as behavioral scientists, choose to conceptualize those interactions between mothers and children, as well as the sorts of techniques which we use to analyse interaction data. I will briefly describe one technique for studying certain kinds of interactions between mothers and their young infants. The technique will be illustrated with data from a longitudinal study of mothers and children, and some preliminary findings will be described in which a sex difference emerged in some consequences of certain early patterns of mutual influence.

The present technique -- or "model" of interaction -- differs from existing models of interaction in an important way. The model states that the child's behavior depends upon recent characteristics of his mother's behavior and that the mother's behavior depends upon recent characteristics of her child's. Thus, at each point in the stream of interactive behavior, this mutual interdependency is assumed to characterize the interaction. Specifically, it is assumed that behavior can be assigned values of intensity and that interaction may be thought of as the trading off of behavioral intensities between the mother and her child. Thus, when we say that the mother influences the child and the child influences the mother, we mean to say that changes in the intensity of the behavior of one causes changes in the intensity of behavior of the other.

Consider the following scenario for mother-child interaction. The mother and her child are together in a room, and each is busily engaged in some activity unrelated to any sort of interaction between them. For example,

the mother may be involved in a telephone conversation or some household task, and the child might be playing with some toys. In many such situations, it seems safe to assume that the child, at least from time to time, will fail to be sufficiently engaged in the non-interactive activity, so that he or she will occasionally bid for interaction with his or her mother. The mother may choose to respond to her child's bid, or she may choose to ignore it.

The present model of interaction attempts to describe mother and child behavior in such a situation. It is assumed that the child bids for interaction via the intensity of its behavior, and that the mother responds, in turn, with varying levels of intensity. A bid for interaction involving a low level of intensity might be a short burst of vocalization; likewise, a bid of relatively high-level intensity might include the child's looking at its mother, smiling at her, vocalizing to her and tugging on her leg simultaneously. The mother may respond with low intensity, for example, by simply looking up at her child; or, she may respond with high intensity, for example, by picking up her child and laughing and smiling.

The model assumes that a child's intensity at any given moment in time depends, fundamentally, upon three things: first, on its own previous level of intensity, assuming that changes in intensity take place graudually rather than suddenly. Second, it depends upon the degree of match between the child's level of intensity and that of the mother: it is assumed that the child's intensity will increase whenever the mother fails to match his or her own level of intensity, or when she overshoots it. Finally, it is assumed that the child's intensity depends upon the rate at which the level of match is changing, that is, that the child's intensity may be influenced by short-term shifts in the degree of match (or mis-match). If the mother responds appropriately -- if she succeeds in meeting but not exceeding the intensity

of her child's demands for attention, it is assumed that the child will gradually withdraw from the interaction and return to playing.

Similar assumptions are made regarding mother behavior. Mother intensity is assumed to be influenced by her own previous level of intensity, as was her child's. In addition, mother intensity is assumed to be influenced by the extent to which her child's behavior is different from hers: that is, she is assumed to increase her own level of intensity whenever her child is more intense than she, and to decrease her level of intensity whenever her child is less intense than she. Provided that she succeeds in responding to these differences, her child's intensity will diminish and she will be able comfortably to return to her non-interactive activity.

Using this model of interaction, it is possible to characterize the style of interaction between a given mother and her child according to the various parameters of interaction described above. Both mothers and children may vary in the extent to which they are governed by previous levels of their own respective behavioral intensities: that is, they may vary according to how perseverative they are in their behavioral intensities. Children may vary in the extent to which they respond to these mismatches between mother and child intensities by intensifying; likewise, mothers may vary in the extent to which they tend towards their infant's level of behavioral intensity. Finally, children may vary in the extent to which they respond to short-term shifts in the extent of match: they may ignore these short-term shifts, or they may be more or less insistent that their mothers maintain a constant and vigilant level of responsiveness to their demands at all times.

A method is described in detail elsewhere (Martin, Note 1) with which a scale of intensity was derived based upon time-series records of the behavior of twenty ten-month-old infants and their mothers who were involved

in interaction similar to that described in the scenario above. For the first part of the interaction, the child was seated on the floor with six colorful and interesting toys, and the mother was busy with a questionnaire given to her by the researcher. A second part of the interaction was included to increase the probability that the child would bid for interaction: the mother was, as before, busy filling out a questionnaire, but the child was placed in a high chair with nothing to do. Having determined a scale of intensity, a second study involving forty-nine mothers and their ten-month-old infants was done and the 'models' which describe how intensity changes over time, described above, were represented as multiple regression equations. These equations were estimated once each for each mother-infant pair. Thus, for the forty-nine mothers and infants, it is possible to specify the extent to which each child intensified when there was a mismatch, the extent to which each mother tended towards her infant's intensity, and the extent to which each child was insistent that his or her mother maintain her level of responsiveness at all times.

Forty-four of the forty-nine mothers and children were observed again one year later. At that time, we observed the mothers and children in four rather contrived situations which we hoped would elicit interesting new forms of interaction between them. First, we asked the mother to attempt to get her child to laugh for a two-minute period of observation. Then, we asked the mother to attempt to get her child to be as quiet and still as possible during a two-minute period. Then, the mother was asked to try to get her child to talk as much as possible for two minutes. After several intervening experimental scenarios, irrelevant to the present discussion, in which the child and the mother played actively and excitedly with one another, the

mother was suddenly given a questionnaire and the child was left in the room with nothing to do, again for a two-minute period. Differences between mothers and children in these four scenarios were most noticeable in their styles of physical contact. Mother physical contact style ranged from close to distant, that is, some mothers tended to hold their children close to them whenever they touched them, while others tended to be "at arm's length" in their physical contact with their children. Children's styles of physical contact ranged from positive to negative, involving hugging and holding on the one hand and kicking, interfering and tugging on the other.

It should be noted at this time that both the ten-month interaction parameters and the twenty-two month physical contact dimensions showed high inter-observer reliability and high short-term stability (that is, one-week stability). To the extent that these measures failed to be perfectly reliable and stable, they were corrected for this unreliability and instability using techniques described in Cronbach's Theory of Generalizability of Behavioral Measures.

Before proceeding, let us return briefly to the notion of interpersonal influence and control. The extent to which a child intensifies his own behavior in response to intensity-discrepancies may be thought of as the extent to which it is influenced by the mother's behavior in the interaction. Likewise, the extent to which the mother tends towards her infant's level of intensity may be thought of as the extent to which she is influenced by her infant's behavior. The following findings emerged about interpersonal influence from the ten-month observation. There were no differences between boys and girls in the extent to which they were influenced by their mothers, nor were there any differences between mothers of girls and mothers of boys in the extent to which they were

influenced by their infants. Likewise, there was no relationship between these measures of influence and the physical contact styles which developed a year later.

Control was measured in the ten-month interaction as follows. It is assumed that if a mother is more strongly influenced by her infant than the infant is by his or her mother, the infant is correspondingly in control of the interaction. Likewise, if an infant is more strongly influenced by its mother than a mother by her infant, the mother may be assumed to be in control. In general, infants were significantly more often in control of these interactions than were their mothers ($p < .05$), but there were no differences in control between mother-son and mother-daughter pairs when control was measured in this way. In addition, we were unable to predict physical contact styles based upon information regarding control in mother-child interactions.

The child's insistent-ness may be thought of as an early form of coercive, non-cooperative behavior for the child. A child who is highly insistent is something of a tyrant: he or she is unwilling to let the mother waiver in her attentiveness even for an instant. If she attempts to withdraw her attention, however briefly, the insistent child will immediately increase its level of intensity. In this study, boys were found to be significantly ($p < .01$) more insistent than girls. In addition, it was found that, for both boys and girls, insistent behavior at age ten months led to negative styles of physical contact at age twenty-two months: for both sexes, there was a large and significant ($p < .01$) positive correlation between insistent-ness and the amount of hitting, interfering and tugging in interactions observed one year later.

More interesting -- and more puzzling -- is a finding relative to insistent behavior and the mother's style of physical contact measured one year later. For girls, we found a strong negative relationship ($p < .01$) between

insistent-ness and closeness of mother contact. That is, girls who were high in the insistent-ness parameter of the ten-month interaction model had relatively distant physical relationships with their mothers one year later. On the other hand, boys who were high in insistent-ness at age ten months had close physical relationships with their mothers at age twenty-two months. The sex difference in these correlations is significant at better than the .001 level. In addition, it should be noted that there were no sex differences in either mother or child physical contact styles at age twenty-two months.

At this point, we are having a difficult time understanding these findings. It does seem clear to us, however, that we may have found in this insistent-ness parameter of the ten-month interaction model something important about the development of dyadic functioning. Specifically, this insistent-ness parameter may tell us something about the development of the balance of control between a mother and her child, which may in turn be a precurser to a child's style of interacting in his social world more generally. We have just completed a third set of observations on thirty-five of the longitudinal children, who are now forty months old. For this part of the study, we are attempting to study a child's coerciveness, resistiveness and compliance with respect to his or her mother, as well as the child's interest and competence in dealing with others in the interpersonal environment. These data are now being analysed. In addition, we hope to replicate all findings with another, larger longitudinal sample of mothers and children.

We cannot be certain, at this early stage, whether the microscopic analysis of changes in the intensity of interactive behavior will tell us anything about the development of a child's social relations, or about the development of differences between mother-son and mother-daughter pairs. These preliminary findings do suggest, however, that the technique is a promising

one. In closing, it should be emphasized that the technique, as it is currently being used, involves a certain set of assumptions which are appropriate to a particular kind of interactional scenario between mothers and ten-month-old infants. The technique was constructed to describe and study those interactions in which both the mother and child are busy, but in which the child is less busy than the mother. This is only one of many different types of mother-child interaction, and other types would probably require different assumptions. Likewise, these different assumptions would require that slightly different "models" be written. However, the method of microscopic analysis of the behavior of mothers and children according to the intensity of that behavior may have applications which go far beyond the present set of models of mother-infant interaction.

REFERENCE NOTE

Martin, J.A. Methodological approaches to mother-infant interaction. Unpublished monograph, 1977.